

REMARKS

In the Office action dated July 16, 2002, claims 1 – 4, 11, 12, 14, and 15 were rejected and claims 5 – 10, 13, and 16 – 20 were objected to. In response, Applicant hereby request further examination and reconsideration of the application in view of the below-provided remarks.

I. Objection to Specification

The Abstract of the disclosure was objected to because it was too long. The Abstract has been amended such that it does not exceed 150 words.

II. Claim Rejections Under 35 U.S.C. 103

Common Ownership of Claimed Inventions

Applicants confirm Examiner's assumption that the subject matter of the various claims was commonly owned at the time the inventions covered in the claims were made.

Claims 1 – 4, 11, 12, 14, and 15

Claims 1 – 4, 11, 12, 14, and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sorin (U.S. Patent No. 5,365,335, referred to hereinafter as "Sorin") in view of Iwaoka et al. (U.S. Patent No. 4,856,899, referred to hereinafter as "Iwaoka").

Applicants assert that claims 1 – 4, 11, 12, 14, and 15 are not rendered obvious from Sorin in view of Iwaoka because a *prima facie* case of obviousness has not been made. Applicants assert that a *prima facie* case of obviousness has not been made for the following reasons 1) there is no teaching or suggestion in Sorin to modify the teachings of Sorin to include the teachings of Iwaoka, and 2) even if the teachings of Sorin are modified in view of Iwaoka, as proposed in the Office action, the modified reflectometer of Sorin does not teach or suggest every limitation of the above-identified claims.

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Background on Sorin

Sorin discloses a “low-coherence reflectometer for use in measuring backscattering.” (Abstract) That is, Sorin discloses a reflectometer that is used to measure the optical properties (specifically, the reflective properties) of a device. The device, whose optical properties are being measured by the reflectometer, is often referred to as the device under test or “DUT”.

The reflectometer disclosed by Sorin in Fig. 3 includes a light source (214), a coupler (216), a device under test (12), an attenuator (240), mirrors (224 and 231), a detector (227), and an analyzer (219). The purpose of the attenuator in the reflectometer disclosed by Sorin is to attenuate the reference signal. According to Sorin, the reference signal is attenuated because the power of the reference signal returned via fiber (223), in many cases of interest, is too large in comparison to the signal from the device under test (12) (the backscattered light). (col. 4, lines 39 – 48) As stated in Sorin at col. 5, lines 16 – 18, “according to the present invention, the reference power is decreased by including an attenuator in the reference *and* of the interferometer.” (Applicants assume that the word “and” was a translation error and that the word should be read as “end”)

Summary of Claimed Invention

The claimed invention involves methods and systems for characterizing an optical signal. The methods and systems, as recited in independent claims 1, 11, and 14 involve combining an input signal with a local oscillator signal and detecting the combined optical signal. In accordance with the invention, the input signal is attenuated before it is combined with the local oscillator signal.

Basis of Rejection for Obviousness

The Office action states that Sorin discloses an input signal, a local oscillator signal, a coupler, an attenuator, and a detector as recited in claims 1, 11, and 14. The Office action goes on to state that although Sorin discloses an attenuator, “Sorin fails to disclose an attenuator positioned before heterodyne signal combination” (Office action page 3, item 3) but that in view of Iwaoka it would have been obvious “to have positioned the attenuator immediately after the input port and before the signal combination as suggested by the placement of Iwaoka’s amplifier since the noise intensity from the input signal is usually a dominant noise source (fig. 5, ref. 2a).”

(Office action page 3, item 3) From this statement, Applicants assume that the Examiner is suggesting that it would have been obvious to change the position of the attenuator (240), as disclosed in Sorin, from fiber (223) to fiber (213).

5 There is no teaching or suggestion in Sorin to modify the teachings of Sorin to include the teachings of Iwaoka

In order to make a *prima facie* case of obviousness, there must be some teaching, suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Applicants assert that the Office action fails to identify a teaching or suggestion in Sorin that the attenuator (240) should be moved to a different position within the disclosed reflectometer. As described above, the attenuator in Sorin is placed in a specific location for the specific, and stated, purpose of reducing the power of the reference signal. Nowhere in Sorin is there a teaching, suggestion, or motivation to move the attenuator to a different location. In particular, Sorin does not teach or suggest that the attenuator should be positioned between the source (214) and the coupler (216) of Sorin as suggested in the Office action.

The Office action does state that Iwaoka provides a suggestion for positioning an attenuator before the input signal is combined with the local oscillator signal. In particular, the Office action states that “[i]t would have been obvious ... to have positioned the attenuator immediately after the input port and before the signal combination *as suggested by the placement of Iwaoka's amplifier*.” [emphasis added] That is, the Office action states that the position of the amplifier in Iwaoka suggests a similar position for an attenuator in the reflectometer of Sorin. Applicants respectfully disagree that the position of the amplifier in Iwaoka suggests a similar position for an attenuator in the reflectometer of Sorin. Iwaoka teaches an amplifier that is positioned such that it can amplify an input signal. Iwaoka does not teach or suggest that an attenuator could be substituted in the same position to attenuate the input signal. Applicants assert that amplifying an optical signal, as taught in Iwaoka, does not suggest attenuating an optical signal in the reflectometer of Sorin. Rather, Applicants assert that amplification of an optical signal teaches away from attenuating a similarly situated optical signal. Because the position of the amplifier in Iwaoka does not suggest a similar position for an attenuator in Sorin, Applicants assert that

the logic provided in the Office action does not meet the threshold for a *prima facie* case of obviousness.

Applicants assert that because there is no teaching or suggestion in Sorin to modify Sorin to include the teachings of Iwaoka and in view of the teachings of Iwaoka, a *prima facie* case of obviousness has not been made and claims 1, 11, and 14 are not rendered obvious from Sorin in view of Iwaoka.

Even if the teachings of Sorin are modified in view of Iwaoka as proposed in the Office action, the modified reflectometer of Sorin does not teach or suggest every limitation of the above-identified claims

Applicants assert that even if Sorin were modified to change the position of the attenuator from fiber (223) to fiber (213), as proposed in the Office action, the proposed modification does not teach or suggest every limitation of claims 1, 11, and 14. To establish *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. [MPEP 2143.03]

Claims 1 and 11 recite the steps of “providing an input signal” and “providing a local oscillator signal.” That is, both claims recite the introduction of two different signals. In contrast, Sorin teaches only one signal. Referring to Fig. 3 of Sorin, there is only one signal introduced to the system. Although the signal in Sorin is subsequently divided into two signals at the coupler (216), the signals that exit the coupler emanate from the same initial signal. Because claims 1 and 11 recite the introduction of two different signals, while Sorin teaches only one signal, Applicants assert that Sorin, even modified to change the position of the attenuator, does not teach every element of claims 1 and 11. Because the modified version of Sorin does not teach every element of claims 1 and 11, Applicants assert that claims 1 and 11 are not rendered obvious from Sorin in view of Iwaoka.

Claim 14 recites an attenuator, an optical coupler, and an optical receiver. The optical coupler has a first input and a second input. The first input of the optical coupler is connected to the attenuator to receive an attenuated input signal and the second input of the optical coupler is for receiving a local oscillator signal. In contrast to claim 14, Sorin teaches an attenuator (240) and a coupler (216) that receive portions of the same signal. Because claim 14 recites a coupler with inputs for receiving two different signals (an input signal and a local oscillator signal), while Sorin teaches a coupler with inputs for receiving only portions of the same signal,

Applicants assert that Sorin, even modified to change the position of the attenuator, does not teach every element recited in claim 14. Because the modified version of Sorin does not teach every element of claim 14, Applicants assert that claim 14 is not rendered obvious from Sorin in view of Iwaoka.

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Claims 2 – 10, 12, 13, and 15 – 20

Claims 2 – 10 are dependent on independent claim 1, claims 12 and 13 are dependent on independent claim 11, and claims 15 – 20 are dependent on independent claim 14. Applicants assert that these claims are allowable based on allowable base
10 claims.

III. Allowable Subject Matter

Applicants note with appreciation that claims 5 – 10, 13, and 16 – 20 are objected to as being dependent upon rejected base claims, but would be allowable if
15 rewritten in independent form including all of the limitations of the base claim and any intervening claim. Applicants have not rewritten the claims, as suggested, in view of the above-provided remarks.


Attached hereto is a marked-up version of the changes made to the
20 specification by the current amendment. The attached page is captioned “VERSION WITH MARKINGS TO SHOW CHANGES MADE.”

Applicants respectfully request reconsideration of the claims in view of the remarks made herein. A notice of allowance is earnestly solicited.

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Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

ABSTRACT

5 Monitoring an optical signal utilizing optical heterodyne detection involves
attenuating an input signal before the input signal is combined with a local oscillator
signal. The input signal is attenuated in order improve the signal to noise ratio of the
heterodyne signal that is generated when the input signal and the local oscillator
signal are combined. The signal to noise ratio of the heterodyne signal improves with
10 attenuation of the input signal, specifically in the case where the intensity noise from
the input signal is the dominant noise source, because the heterodyne signal and the
intensity noise of the input signal scale differently with attenuation of the input signal.
~~An optical heterodyne detection system includes an attenuator that receives an input~~
~~signal and attenuates the input signal before the input signal is combined with a local~~
15 ~~oscillator signal. An optical coupler combines the attenuated input signal and the~~
~~local oscillator to create a combined optical signal that is output to an optical receiver.~~
~~The optical receiver generates an electrical signal that is representative of the~~
~~combined optical signal. The electrical signal is utilized by a processor to generate an~~
~~output signal that is indicative of an optical parameter of the input signal. The~~
20 ~~processor monitors a heterodyne signal that is a component of the combined optical~~
~~signal to generate the output signal. The original input signal is attenuated before~~
~~being combined with the local oscillator signal to improve the signal to noise ratio of~~
~~the heterodyne signal, especially in the case where the intensity noise of the input~~
~~signal is the dominant noise source for the combined optical signal. The signal to~~
25 ~~noise ratio improves with attenuation of the input signal because the heterodyne signal~~
~~and the intensity noise of the input signal scale differently with attenuation of the~~
~~input signal. The attenuation of the input signal may be adjusted to optimize the~~
~~signal to noise ratio of the heterodyne signal. A feedback loop may be provided~~
~~between the processor and the adjustable attenuator so that the attenuator can be~~
30 ~~adjusted in response to real time measurements of the signal to noise ratio of the~~
~~heterodyne signal.~~